

What is claimed is:

1. A component of a plasma reactor chamber for processing a semiconductor workpiece, said component comprising a monolithic ceramic piece comprising a mixture of yttrium aluminum perovskite (YAP) and yttrium aluminum garnet (YAG), said mixture being in a ratio of YAP to YAG material sufficiently close to about 60%-40% so that said monolithic ceramic piece has a fracture toughness of at least 2 megaPascal-m^{1/2}.

2. The component of Claim 1 wherein said ratio of said mixture is in a range between about 65%-35% and 55%-45% of YAP to YAG, respectively.

3. The component of Claim 1 wherein said ratio of said mixture is in a range between about 70%-30% and 50%-50% of YAP to YAG, respectively.

4. The component of Claim 1 wherein said ratio is in mole percentages.

5. The component of Claim 1 wherein said ratio is approximately 60%-40% of YAP to YAG in mole percentages.

6. The component of Claim 1 wherein said ratio is such that said fracture toughness is about 3.6 megaPascal-m^{1/2}.

7. A component of a plasma reactor for processing a semiconductor workpiece, said component comprising a monolithic ceramic piece comprising a mixture of yttrium aluminum perovskite

(YAP) and yttrium aluminum garnet (YAG), said mixture being in a ratio of YAP to YAG material so that said monolithic ceramic piece has a fracture toughness sufficient to be machinable.

5 8. The component of Claim 7 wherein said ratio of said mixture is in a range between about 65%-35% and 55%-45% of YAP to YAG, respectively.

10 9. The component of Claim 7 wherein said ratio of said mixture is in a range between about 70%-30% and 50%-50% of YAP to YAG, respectively.

15 10. The component of Claim 7 wherein said ratio is in mole percentages.

 11. The component of Claim 7 wherein said ratio is approximately 60%-40% of YAP to YAG in mole percentages.

20 12. The component of Claim 7 wherein said ratio is such that said fracture toughness is about 3.6 megaPascal-m^{1/2}.

25 13. The component of Claim 7 wherein said component comprises one of: (a) an annular ring of said plasma reactor chamber, (b) a wall of said plasma reactor chamber.

 14. A monolithic ceramic component of a plasma reactor chamber for processing a semiconductor workpiece, said component produced by a process comprising:

30 forming a mixture of a yttria powder and an alumina powder in a ratio of yttria to alumina powders lying within a range

between 50%-50% and 62%-48% mole percentage;

pressing said mixture together in a mold to form a green body thereof;

heat treating said green body to form a hardened ceramic
5 comprising a mixture of yttrium aluminum perovskite (YAP) and
yttrium aluminum garnet (YAG).

15. A component of a plasma reactor chamber for processing a
semiconductor workpiece, said component being a monolithic ceramic
10 piece constituting a mixture of yttrium aluminum perovskite (YAP)
and yttrium aluminum garnet (YAG).

16. The component of Claim 15 wherein said mixture is in a
ratio of YAP to YAG material sufficiently close to about 60%-40% so
15 that said monolithic ceramic piece has a fracture toughness of at
least 2 megaPascal-m^{1/2}.

17. A component of a plasma reactor chamber for processing a
semiconductor workpiece, said component being a monolithic ceramic
20 piece constituting a mixture of yttrium aluminum perovskite (YAP)
and yttrium aluminum garnet (YAG) formed from a mixture of yttria
and alumina powders, the ratio said powders in said mixture being
within a range between one ratio at which at least nearly pure
yttrium aluminum perovskite is formed and another ratio at which at
25 least nearly pure yttrium aluminum garnet is formed.

18. The component of Claim 17 wherein said component is a
ceramic ring surrounding a wafer support pedestal within the
chamber.

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19. The component of Claim 17 wherein said component is a wall of the chamber.

20. The component of Claim 18 wherein said piece comprise an
5 array of YAG grains and YAP grains in which cracks propagate transgranularly across the YAG grains and intragranularly within the YAP grains.